Mobile mapping for the 3D-modelling of intertidal zones of beaches

Vandenbulcke Annelies, Cornelis Stal, Annelies Incoul, Philippe De Maeyer, and Alain De Wulf

Department of Geography, Faculty of Sciences, Ghent University, Krijgslaan 281 (S8),
B-9000 Gent, Belgium
E-mail: annelies.vandenbulcke@ugent.be

In the context of the interdisciplinary research project SeArch Digital Surface Models (DSMs) of intertidal zones of beaches are required. The SeArch project aims to document and manage archaeological patrimony in the North Sea. DSMs are an indispensable tool for the development and sustainable management of cultural heritage and archaeological relicts. These 3D-models are commonly used for the analysis of existing archaeological features or for the detection of new features. The objective of the Department of Geography in this project is to create an innovative survey methodology which allows accurate and cost-efficient creation of the needed DSMs of the intertidal zones. Conventional topographic and bathymetric surface modelling methodologies are not sufficient for these areas and new surveying approaches are required. In the summer of 2013, a field campaign was conducted on the beach of Raversijde (Belgium). During this campaign an amphibious vehicle was equipped with a terrestrial laser scanner, a movement sensor and a GNSS system. Previous feasibility studies have demonstrated that this kind of set-up is very promising for intertidal surface modelling in comparison with other measurement techniques. The configuration with an amphibious vehicle also enables data acquisition during bad weather and with difficult terrain conditions in a reasonable time and at a reasonable cost. Moreover, the technique appears to close the spatial incompleteness between land measurements and measurements in very shallow water.

The main goal of this first campaign was the construction of the DSMs with high resolution and high accuracy, but the used laser scanner also returns a backscatter value for each measured point. Provisional analysis of these values suggests a relation between the physical properties of the reflecting surface and the registered values. As a result, further development of the platform is planned and additional campaigns for a more extensive surface modelling of the intertidal zones of the Belgian North Sea coast will be organised. Various different techniques, like the use of an Unmanned Aerial Vehicle, will also be deployed in the additional campaigns. Analysis will define the advantages and disadvantages of these techniques for the construction of the required DEMs and for archaeological research.